CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

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Project Number

S0815

Project Title

The Styrofoam Solution

Abstract

Objectives/Goals

Expanded polystyrene (EPS), commonly referred to as Styrofoam, is a non-biodegradable plastic that is difficult to recycle by standard methods. As such, rapidly growing amounts of EPS waste in landfills are a serious threat to the environment. We decided to investigate possible methods of controlling this form of pollution.

Methods/Materials

We selected 12 solvents having a similar molecular structure to that of the styrene monomer, which should, therefore, dissolve polystyrene. Food-grade, craft-grade, and industrial grade EPS samples were individually added to 100mL of each solvent for a period of ten minutes. The initial and final masses of both the solvent and the EPS were recorded, as well as qualitative observations

Results

All but three solvents caused the EPS to progress along the same continuum of physical change during the dissolution process, although at varying rates. The results regarding percent mass change showed that the EPS absorbed large amounts of solvent over the course of dissolution. Xylene (the quickest), lemon oil, turpentine, and camphor oil completely dissolved all grades of EPS. The exceptions to the above patterns were water (the control, which had no effect on EPS), acetone, and diluted acetone. There was a large, unexplained discrepancy between the initial and final masses of their solutions, and large bubbles appeared when EPS was in contact with these solvents.

Conclusions/Discussion

EPS can be effectively and quickly dissolved by at least four solvents, two of which are entirely natural. The completely effective solvents contained, or were themselves, high aromatic hydrocarbons. However, based upon our observations of a #dissolution continuum# it is highly probable that all of the tested solvents would have been effective if allotted more time; thus, low aromatic and aliphatic hydrocarbons may also be effective. The mass discrepancy in acetone solutions, when coupled with experimental observations, strongly points to the release of invisible vapor during a chemical reaction between the EPS and the acetone.

The results of this study are extremely valuable in that they indicate an efficient, natural solution for the mounting problem of EPS pollution: distillation of an EPS solution so that the plastic may be reclaimed and recycled.

Summary Statement

A study of the effectiveness of various hydrocarbon solvents in the dissolution of expanded polystyrene waste for reclamation.

Help Received

Used lab equipment at La Reina High School under the supervision of Mrs. Adrienne Reeves and Mrs. Marilyn Usher